

## Claims

I claim:

1. A suspension system supporting a vehicle body, said system comprising:

a wheel;

5 an energy absorbing assembly including a spring and damper connected between said wheel to said vehicle body;

a rheological force device connected between said wheel and said vehicle body and acting independently of said energy absorbing assembly, said rheological force device providing a variable supplemental resistive force between each of said wheels and  
10 said vehicle body;

at least one sensor to sense at least one vehicle operating parameter;

a controller in communication with said rheological force device and controlling said device in response to said at least one vehicle operating parameter to thereby control said variable supplemental resistive force.

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2. The system described in claim 1, wherein said rheologic force devices comprise a movable piston disposed within a housing containing one of magnetorheological and electrorheological fluid,

said piston movement being dependent on said fluid viscosity.

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3. The system described in claim 2, wherein said fluid viscosity is dependent upon a electrical/magnetic field applied to said fluid.

4. The system described in claim 3 wherein said electrical/magnetic field is applied  
25 to said fluid by a coil integrally connected to said piston.

5. The system as described in claim 4 wherein the relative movement between said vehicle body and said at least two wheels is at least partially dependent on said electrical/magnetic field applied to said fluid.

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6. The system described in claim 1, wherein said sensors include at least one of steering wheel angle, lateral acceleration, or vehicle speed.
7. The system described in claim 1, wherein said sensors include at least steering  
5 wheel angle, lateral acceleration, and vehicle speed.
8. The system described in claim 1, wherein said controller processes said signal by applying a predetermined algorithm.
- 10 9. The system described in claim 1, wherein said suspension system includes at least two said rheological force devices disposed on opposite sides of said vehicle, said rheological devices being independently controlled by said controller.
- 15 10. The system as described in claim 1, wherein said suspension system includes at least four rheological force devices, said rheological devices being independently controlled by said controller.
11. The system as described in claim 1, wherein said controller and said force devices operate on a 12 volt system,  
20 said controller communicating with said force devices by sending information to an electrical interface system, said electrical interface system sending an electrical signal to said electrical force device.
- 25 12. A controllable suspension system, said system comprising:  
at least two wheels,  
at least two wheel supporting members for rotatably supporting each of said at least two wheels,  
a vehicle body,  
30 a suspension system connecting said wheel supporting members to said body,

said suspension system comprising shock absorbers, coil springs, and at least two force devices,

at least one sensor that senses a vehicle performance parameter and communicates said parameters as a signal,

5 a controller that processes said signal and communicates electronic information to said at least two force devices,

said at least two force devices directly modifying said suspension system response.

10 13. The system described in claim 12, wherein each of said at least two wheel supporting members includes an axle.

14. The system described in claim 12, wherein said magnetic rheologic force devices comprise a movable piston disposed within a housing filled with one of

15 magnetorheological and electrorheological fluid,

said piston movement being dependent on said fluid viscosity.

15. The system described in claim 14, wherein said fluid viscosity is dependent upon an electrical/magnetic field applied to said fluid.

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16. The system described in claim 15, wherein said electrical/magnetic field is applied to said fluid by a coil integrally connected to said piston.

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17. The system as described in claim 14, wherein the relative movement between said vehicle body and said at least two wheel support members is at least partially dependent on said electrical/magnetic field applied to said fluid.

18. The system described in claim 12, wherein said sensors include at least one of steering wheel angle, lateral acceleration, or vehicle speed.

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19. The system described in claim 12, wherein said sensors include at least steering wheel angle, lateral acceleration, and vehicle speed.

20. The system described in claim 19, wherein said controller processes said signal by  
5 applying a predetermined algorithm.

21. The system as described in claim 21, wherein said controller and said force devices operate on a 12 volt system.

10 22. The system as described in claim 21, wherein said rheologic force device is connected in parallel with said shock absorber and said coil spring.

23. The system as described in claim 21, wherein said rheologic force device is connected in parallel with one of said shock absorber and said coil spring.

15 24. The system as described in claim 21, wherein said rheologic force device is connected in series with a combination of said coil spring and said shock absorber.

20 25. The system as described in claim 21, wherein said rheologic force device is connected in series with one of said coil spring and said shock absorber.

26. The system as described in claim 22, wherein said suspension system includes at least four rheological force devices,  
said rheological devices being independently controlled by said controller.

25 27. A vehicle body roll reducing system, said system comprising:  
at least two wheels,  
at least two wheel supporting members for rotatably supporting each of said at least two wheels,  
30 a vehicle body,  
a suspension system connecting said wheel supporting members to said body,

said suspension system comprising coil springs, shock absorbers, and at least two magnetic rheologic force devices,

said at least two magnetic rheologic force devices being disposed on opposite sides of said vehicle,

5       said magnetic rheologic force devices comprising a movable piston disposed within a housing filled with one of magnetorheological or electrorheological fluid,

          said piston movement being dependent on said fluid viscosity,

          said fluid viscosity being dependent on the electrical field applied to said fluid, movement between said wheel support member and said vehicle body being at

10      least partially dependent on said electrical field applied to said fluid,

          said magnetic rheological force devices functioning independently of said coil springs and said shocks,

          said magnetic rheologic force devices having no direct connection to said shock and said coil spring,

15      at least one sensor that senses a vehicle performance parameter and communicates said parameters as a signal,

          said at least one sensor sensing at least one of steering wheel angle, lateral acceleration, and vehicle speed,

          a controller that processes said signal and communicates electronic information to

20      said at least two magnetic rheological force devices through an electrical interface system,

          said at least two magnetic rheological force devices directly modifying said suspension system response,

          said controller processing said signal by means of a predetermined algorithm,

25      said controller and said two magnetic rheologic force devices operating on a twelve volt system.

28.     A vehicle body roll reducing system for a suspension of a vehicle having at least one pair of axles each provided with at least one pair of wheels mounted thereon, said

30      vehicle body roll reducing system comprising:

a first wheel supporting member for rotatably supporting a first wheel of said at least one pair of wheels mounted on one of said at least one pair of axles;

a second wheel supporting member for rotatably supporting a second wheel of said at least one pair of wheels mounted on one of said at least one pair of axles;

5        a first spring and shock absorber assembly connecting said first wheel supporting member to a vehicle body;

      a second spring and shock absorber assembly connecting said second wheel supporting member to said vehicle body;

      first and second force devices functioning independently from said first and  
10      second spring and shock absorber assemblies, said first force device connecting said first wheel supporting member to said vehicle body, said second force device connecting said second wheel supporting member to said vehicle body, each of said first and second force devices is filled with one of a magnetorheological and electrorheological fluid and provides a resistance to the displacement of said wheel supporting members relative to  
15      said vehicle body due to a viscosity of said fluid;

      at least one sensor for sensing a vehicle condition and producing a sensor signal indicative of said vehicle condition; and

      a controller responsive to said sensor signal of said at least one sensor for deriving a control signal to operate said first and second force devices by varying said viscosity of  
20      said fluid.

29.      The vehicle body roll reducing system as defined in claim 24, wherein each of said first and second force devices includes:

      a housing filled with one of said magnetorheological and electrorheological fluid;  
25      and

      a piston member provided for displacement within said housing so that an amount of displacement of said piston relative to said housing being limited by resistance provided by a viscosity of said fluid.